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Grace under pressure: Mechanical regulation of the cytoskeleton



Daniel Fletcher

Professor

**Department of
Bioengineering**

**University of
California**

Berkeley, CA

Abstract: Organized networks of actin filaments drive membrane protrusions, guide intracellular organization, and contribute to the mechanical rigidity of eukaryotic cells. In each of these roles, actin networks are exposed to external forces, such as tension transmitted to adherent cells through deformation of the extracellular matrix or compression encountered by single cells and tissues during confined movement and growth. While the biochemical basis for assembly and disassembly of the diverse actin network architectures found in cells has received significant attention, the role of physical inputs is less well understood. This talk will present evidence from optical and force microscopy studies that mechanical forces play a crucial role in organizing actin structures, particularly branched networks formed at membranes. These results draw attention to the importance of physical boundary conditions in understanding the molecular mechanisms that govern cellular organization.

Biography: Dan Fletcher is the Lloyd Distinguished Professor of Bioengineering and Biophysics at UC Berkeley, where his research focuses on the development of biomedical instruments and biophysical techniques to study cell mechanics and the cytoskeleton. Dr. Fletcher received a B.S.E. from Princeton University and a D.Phil. from Oxford University where he was a Rhodes Scholar. He received a Ph.D. from Stanford University as an NSF Graduate Research Fellow and was a Postdoctoral Fellow in the Stanford University School of Medicine as part of the Stanford Bio-X program. His research has received an NSF CAREER Award, a Tech Award from the San Jose Tech Museum, was designated “Best of What’s New” by Popular Science magazine, and he has served as a White House Fellow in the Office of Science and Technology Policy. Dr. Fletcher is currently the Vice Chair of the Bioengineering Department at UC Berkeley and Deputy Director of the Physical Biosciences Division of Lawrence Berkeley National Laboratory. He is also Faculty Affiliate of QB3, CITRIS, and CEND, and a member of the Bioengineering, Biophysics, and Nanoscale Science and Engineering Graduate Groups.